



## Description

The SI4447DY-T1-E3 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS} = -40V$   $I_D = -13A$

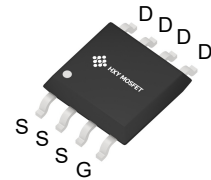
$R_{DS(ON)} < 19m\Omega$  @  $V_{GS}=10V$

## Application

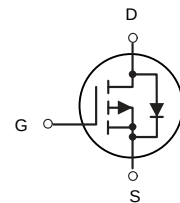
Battery protection

Load switch

Uninterruptible power supply



SOP-8  
(SOIC-8)



P-Channel MOSFET

## Ordering Information

| Product ID     | Pack          | Brand      | Qty(PCS) |
|----------------|---------------|------------|----------|
| SI4447DY-T1-E3 | SOP-8(SOIC-8) | HXY MOSFET | 3000     |

## Absolute Maximum Ratings (Tc=25°C unless otherwise noted )

| Symbol               | Parameter                                                 | Rating     | Units |
|----------------------|-----------------------------------------------------------|------------|-------|
| $V_{DS}$             | Drain-Source Voltage                                      | - 40       | V     |
| $V_{GS}$             | Gate-Source Voltage                                       | $\pm 20$   | V     |
| $I_D@T_A=25^\circ C$ | Drain Current <sup>3</sup> , $V_{GS}$ @ 10V               | -13        | A     |
| $I_{DM}$             | Pulsed Drain Current <sup>1</sup>                         | -52        | A     |
| $P_D@T_A=25^\circ C$ | Total Power Dissipation                                   | 3          | W     |
| TSTG                 | Storage Temperature Range                                 | -55 to 150 | °C    |
| $T_J$                | Operating Junction Temperature Range                      | -55 to 150 | °C    |
| $R_{thj-a}$          | Maximum Thermal Resistance, Junction-ambient <sup>3</sup> | 41         | °C/W  |



### Electrical Characteristics (T<sub>J</sub> = 25°C, unless otherwise noted)

| Parameter                               |                       | Symbol               | Test Conditions                                                                            | Min. | Typ. | Max. | Unit |
|-----------------------------------------|-----------------------|----------------------|--------------------------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics                  |                       |                      |                                                                                            |      |      |      |      |
| Drain-Source Breakdown Voltage          |                       | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                                              | -40  | -    | -    | V    |
| Gate-body Leakage current               |                       | I <sub>GSS</sub>     | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V                                               | -    | -    | ±100 | nA   |
| Zero Gate Voltage Drain Current         | T <sub>J</sub> =25°C  | I <sub>DSS</sub>     | V <sub>DS</sub> = -40V, V <sub>GS</sub> = 0V                                               | -    | -    | -1   | μA   |
|                                         | T <sub>J</sub> =100°C |                      |                                                                                            | -    | -    | -100 |      |
| Gate-Threshold Voltage                  |                       | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                | -1.0 | -1.5 | -2.2 | V    |
| Drain-Source On-Resistance <sup>4</sup> |                       | R <sub>DS(on)</sub>  | V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A                                              | -    | 14.0 | 19   | mΩ   |
|                                         |                       |                      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5 A                                             | -    | 19.5 | 25   |      |
| Forward Transconductance <sup>4</sup>   |                       | g <sub>fs</sub>      | V <sub>DS</sub> = -10V, I <sub>D</sub> = -10A                                              | -    | 44   | -    | S    |
| Dynamic Characteristics <sup>5</sup>    |                       |                      |                                                                                            |      |      |      |      |
| Input Capacitance                       |                       | C <sub>iss</sub>     | V <sub>DS</sub> = -20V, V <sub>GS</sub> =0V, f =1MHz                                       | -    | 2525 | -    | pF   |
| Output Capacitance                      |                       | C <sub>oss</sub>     |                                                                                            | -    | 190  | -    |      |
| Reverse Transfer Capacitance            |                       | C <sub>rss</sub>     |                                                                                            | -    | 172  | -    |      |
| Gate Resistance                         |                       | R <sub>g</sub>       | f =1MHz                                                                                    | -    | 10   | -    | Ω    |
| Switching Characteristics <sup>5</sup>  |                       |                      |                                                                                            |      |      |      |      |
| Total Gate Charge                       |                       | Q <sub>g</sub>       | V <sub>GS</sub> = -10V,V <sub>DS</sub> = -20V, I <sub>D</sub> = -10A                       | -    | 35   | -    | nC   |
| Gate-Source Charge                      |                       | Q <sub>gs</sub>      |                                                                                            | -    | 5.5  | -    |      |
| Gate-Drain Charge                       |                       | Q <sub>gd</sub>      |                                                                                            | -    | 8    | -    |      |
| Turn-On Delay Time                      |                       | t <sub>d(on)</sub>   | V <sub>GS</sub> = -10V, V <sub>DD</sub> = -20V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = -10A | -    | 14.5 | -    | ns   |
| Rise Time                               |                       | t <sub>r</sub>       |                                                                                            | -    | 20.2 | -    |      |
| Turn-Off Delay Time                     |                       | t <sub>d(off)</sub>  |                                                                                            | -    | 32   | -    |      |
| Fall Time                               |                       | t <sub>f</sub>       |                                                                                            | -    | 10   | -    |      |
| Drain-Source Body Diode Characteristics |                       |                      |                                                                                            |      |      |      |      |
| Diode Forward Voltage <sup>4</sup>      |                       | V <sub>SD</sub>      | I <sub>S</sub> = -10A, V <sub>GS</sub> = 0V                                                | -    | -    | -1.2 | V    |
| Continuous Source Current               | T <sub>C</sub> =25°C  | I <sub>S</sub>       | -                                                                                          | -    | -    | -13  | A    |

Note :

1. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C.
2. The EAS data shows Max. rating . The test condition is V<sub>DD</sub>= -25V, V<sub>GS</sub>= -10V, L= 0.1mH, I<sub>AS</sub>= -34A.
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
5. This value is guaranteed by design hence it is not included in the production test.



## Typical Characteristics

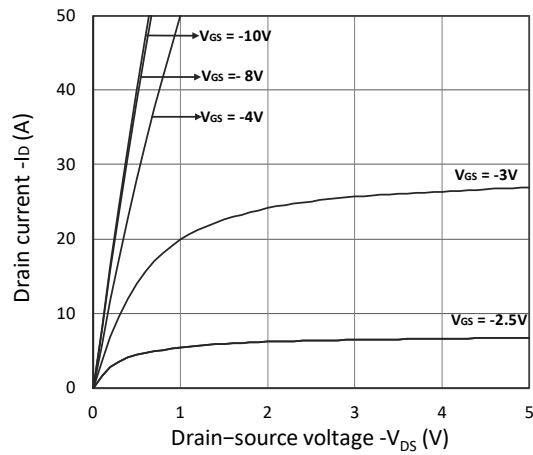


Figure 1. Output Characteristics

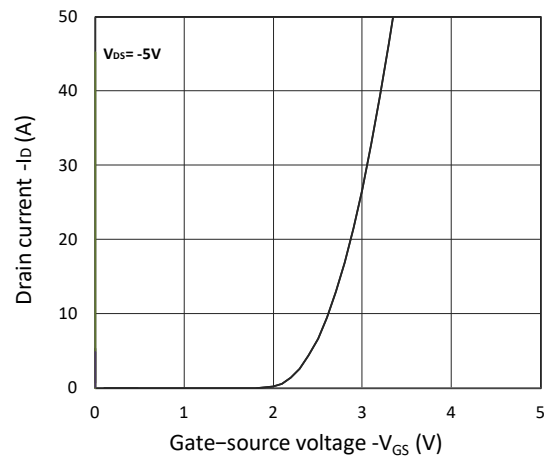


Figure 2. Transfer Characteristics

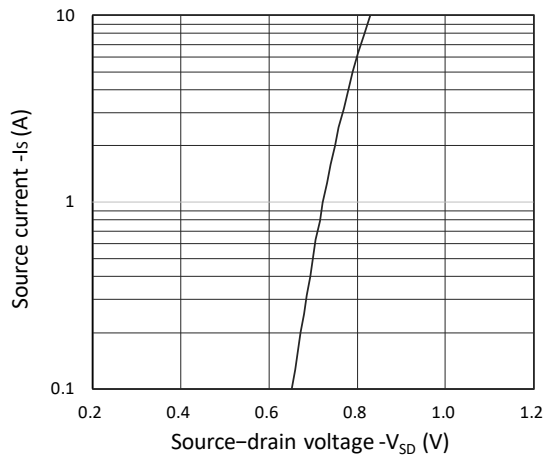


Figure 3. Forward Characteristics of Reverse

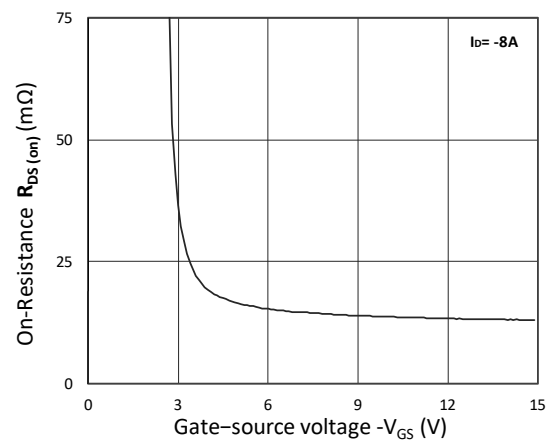


Figure 4.  $R_{DS(on)}$  vs.  $V_{GS}$

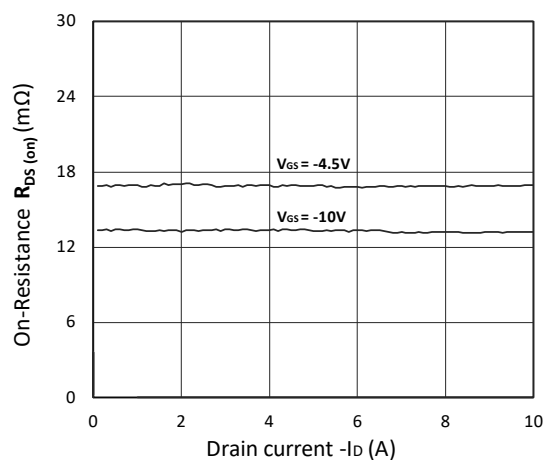


Figure 5.  $R_{DS(on)}$  vs.  $I_D$

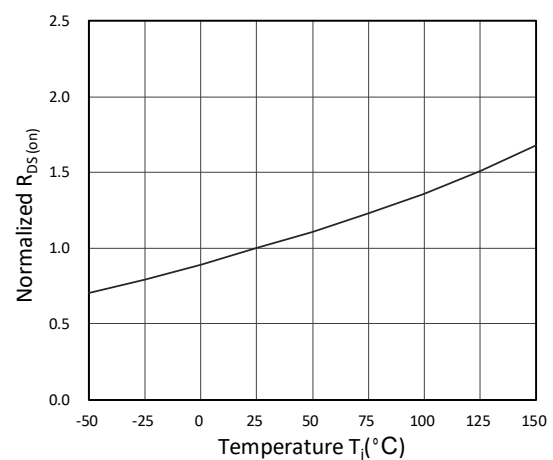


Figure 6. Normalized  $R_{DS(on)}$  vs. Temperature

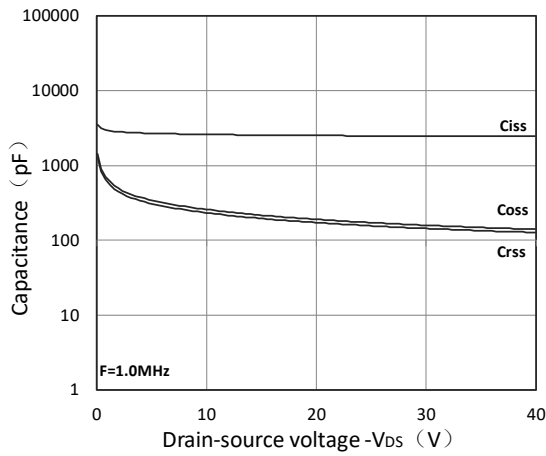


Figure 7. Capacitance Characteristics

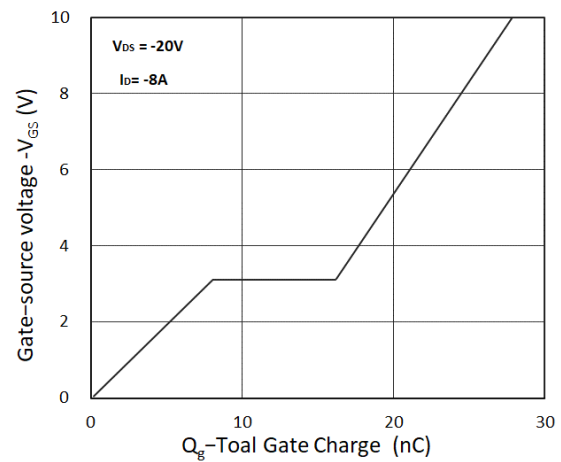


Figure 8. Gate Charge Characteristics

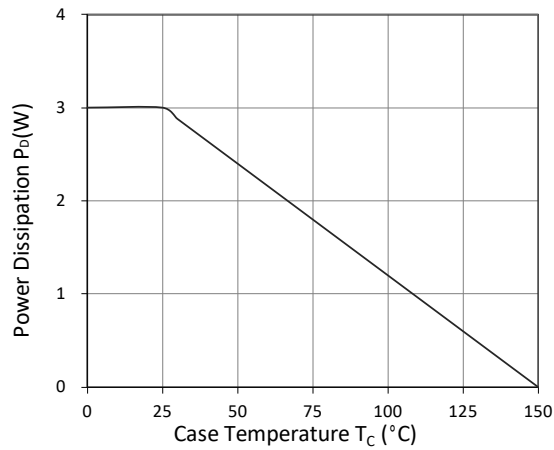


Figure 9. Power Dissipation

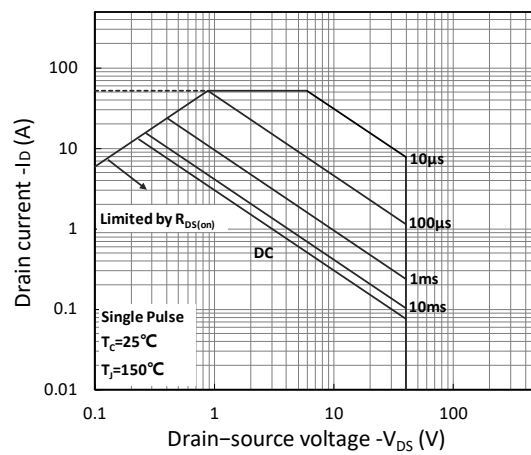


Figure 10. Safe Operating Area

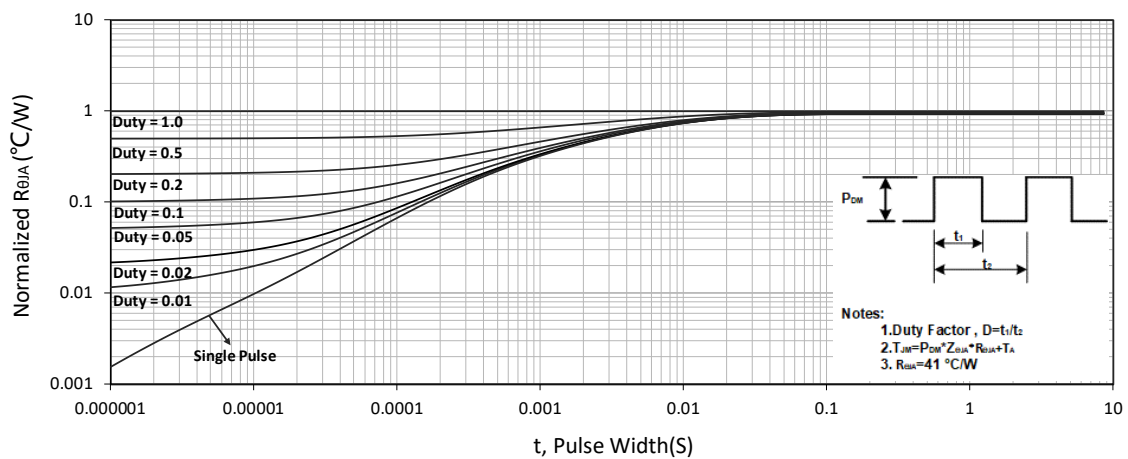


Figure 11. Normalized Maximum Transient Thermal Impedance



## Test Circuit

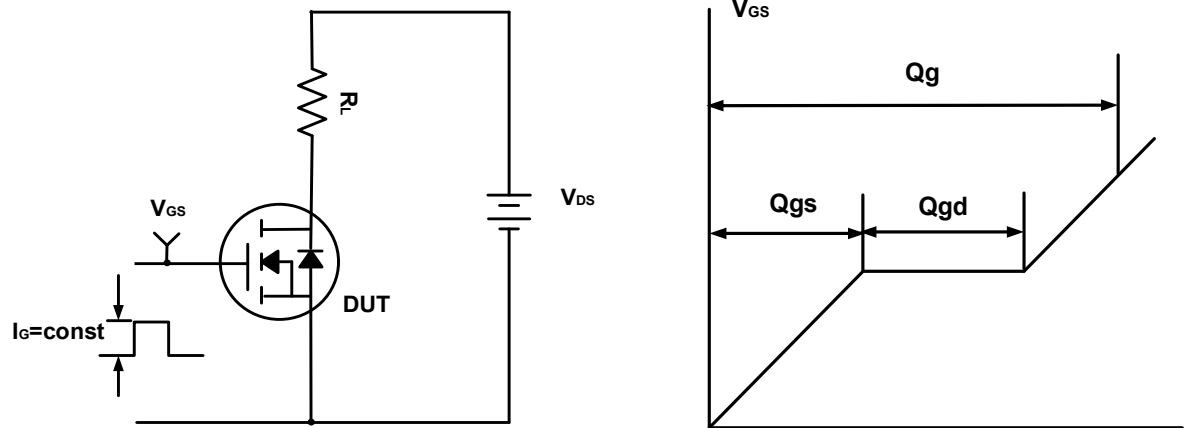


Figure A. Gate Charge Test Circuit & Waveforms

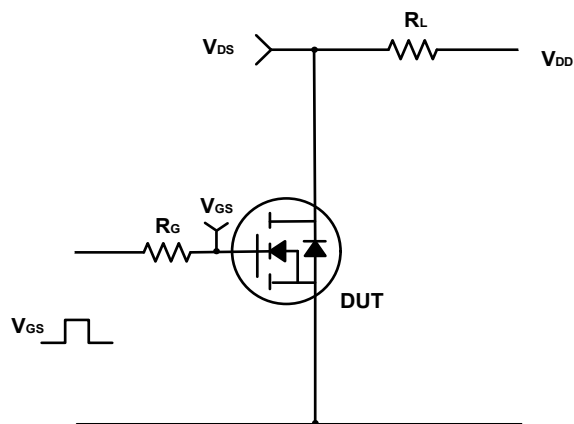


Figure B. Switching Test Circuit & Waveforms

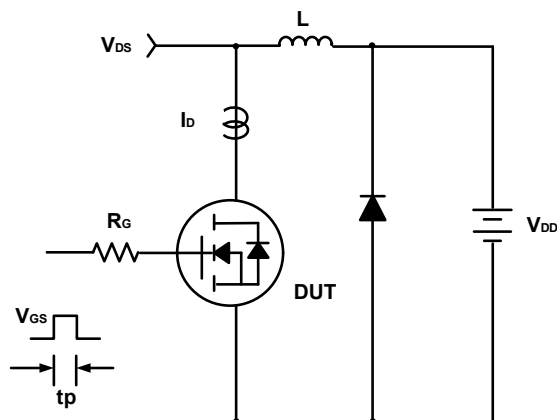
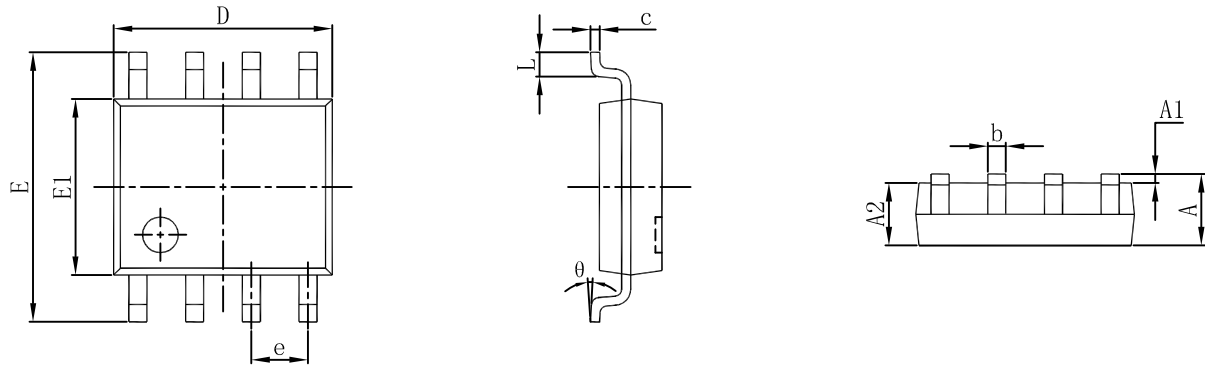


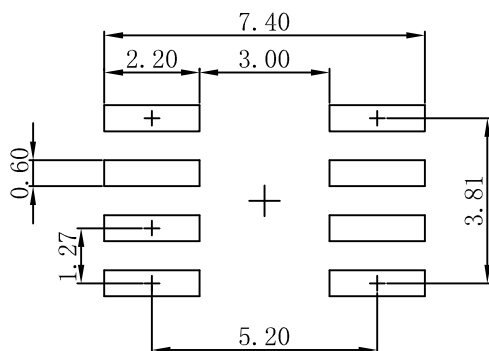
Figure C. Unclamped Inductive Switching Circuit & Waveforms



## SOP-8(SOIC-8) Package Outline Dimensions



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1     | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2     | 1.350                     | 1.550 | 0.053                | 0.061 |
| b      | 0.330                     | 0.510 | 0.013                | 0.020 |
| c      | 0.170                     | 0.250 | 0.007                | 0.010 |
| D      | 4.800                     | 5.000 | 0.189                | 0.197 |
| e      | 1.270 (BSC)               |       | 0.050 (BSC)          |       |
| E      | 5.800                     | 6.200 | 0.228                | 0.244 |
| E1     | 3.800                     | 4.000 | 0.150                | 0.157 |
| L      | 0.400                     | 1.270 | 0.016                | 0.050 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |



Note:  
1. Controlling dimension: in millimeters.  
2. General tolerance:  $\pm 0.05\text{mm}$ .  
3. The pad layout is for reference purposes only.



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